EXCIMER LASER CORONARY ANGIOPLASTY OF CALCIFIED LESIONS

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Coronary artery calcification is considered a relative contraindication to PTCA. Because of its ability to ablate calcium, excimer laser coronary angioplasty (ELCA) may be preferable for treatment of calcified lesions. Of the first 310 lesions treated with ELCA, 95 lesions in 83 patients were calcified. There were 67 men and 21 women. Mean age was 66±10 yr (range 36-88 yr). There were 56 LAD lesions (59%), 16 RCA (17%), 2 LCX (2%), 2 left main, and 2 SVG. Average length was 12±7mm.

A 308nm XeCl excimer laser pulsed at 20hz was coupled to catheters 1.3, 1.6, and 2.0mm. Catheter tip energies ranged between 35 and 60mJ/mm2.

Laser success (>20% reduction in stenosis with laser alone) was 68/95 (72%). Procedure success (final stenosis <50%) was 91/95 (96%). 71 lesions (75%) were treated with adjunctive PTCA. In some cases partial success with the laser allowed passage of a PTCA balloon, where this was not possible before. Complications included dissection (14%), emergency surgery (2%), sustained closure (3%), MI (2%), spasm (2%), arrhythmia (2%), and transient closure (1%). There were no perforations and no deaths.

Conclusion: ELCA alone or in combination with PTCA is an effective treatment for calcified lesions.

SELECTIVE ABLATION OF ATHEROMA BY PULSED HOLMIUM YAG LASER.

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To assess the ablation efficacy and the mechanism of atheromatous tissue ablation of pulsed Holmium (Ho)YAG laser, the effects of pulsed Ho-YAG laser of 2.1 µm of wavelength (250 µsec, 3.5 Hz) were evaluated using normal (N) and atheromatous (Ath) human arteries. Lasing was done using a 5 F multifiber catheter (14 x 100 µm). The tissue was lased in the tubing filled with blood or saline. During laser ablation shock waves (SW) were measured using a strain-gauge pressure transducer connected to the tubing. Ablated volume (Vol) was calculated from the radius (r) and depth (h) of the crater ; Vol =πr2h(mm3.) Microscopic study was done to evaluate laser effects on the arterial tisssue. Results: The ablation efficiency (A.E;Vol/J) was as follows;

Tissue	Medium	n	A. E. (x10-2mm3/J)	SW(mmHg)
N	Saline	19	5.5 ± 2.5	1.2 ± 0.67
Ath	Saline	19	13 ± 4.4 **	2.9 ± 0.69 *
N	Blood	13	5.9 ± 2.7	0.88+0.38
Ath	Blood	13	14 ± 3.5 **	2.5±0.7 **

n= number of craters *P<0.05, **P<0.001 vs N

A.E. was correlated with the magnitude of SW (r=0.74,P< 0.001). At 0.5 mm distance, the laser could ablate atheroma in blood. There was no extensive thermal injury, no dissection and no cracks induced by SW. Conclusions:, (1) pulsed Ho-YAG laser has selectivity for atheroma, (2) blood medium does influence neither the ablation efficacy nor the magnitude of SW, (3) ablation efficiency was closely correlated with SW, and (4) pulsed Ho- YAG laser can ablate atheroma without contact of the fiber.

PERCUTANEOUS PULSED MID-INFRARED CORONARY LASER ANGIOPLASTY: INITIAL EXPERIENCE

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To determine the efficacy and safety of coronary pulsed mid-infrared laser angioplasty (LA), a Holmium-Yttrium Aluminum Garnet laser coupled into a multifiber catheter was used to recanalize stenosed (n=13) or totally occluded (n=10) coronary arteries. There were 18 left anterior descending arteries, 4 right coronary arteries and 1 venous graft. The L was operated at 2.1 µm, 250 msec and 500 mJ per pulse at 3.5 Hz. The L catheter consisted of 37 optical fibers of 150 µm each concentrically arranged around a 0.018" central lumen and a soft leading tapered distal tip to maintain coaxial alignment and position plaque in front of fibers. After passage of the guidewire through the obstruction, the catheter was advanced over the wire during L emission. In 3 patients (pts) the catheter could not be positioned against the obstruction. In the remaining 20 pts, LA increased the lumen diameter from 0.3±0.3 to 1.4±0.3 mm and reduced the stenosis from 91±8 to 57±10% (p<0.001). Three pts were left on stand-alone LA. In 17 pts subsequent balloon dilatation reduced the stenosis to 20±18%. In 2 pts who had previously failed dilatation with high inflation pressure, LA allowed subsequent successful dilatation with low pressure. There were no death, no perforation, no arrhythmia. Spasm occurred in 4 pts and chest sensation in 6 during L emission.
Conclusions: 1/ Pulsed mid-infrared LA is effective and safe for recanalizing stenosed or totally occluded coronary arteries; 2/ the efficacy may be sufficient in selected cases for stand-alone LA; 3/ The technique may improve the efficacy of balloon angioplasty in case of primary dilatation failure.

PROCEDURAL SUCCESS, IN-HOSPITAL EVENTS, AND FOLLOW-UP CLINICAL AND ANGIOGRAPHIC RESULTS OF PERCUTANEOUS CORONARY EXCIMER LASER-ASSISTED ANGIOPLASTY.

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While percutaneous coronary excimer (308 nm) laser-assisted angioplasty appears feasible; its safety and long-term efficacy are unknown. Therefore, procedural success, in-hospital events, and ≥ 6 month follow-up were analyzed in the first 86 pts treated with 1.5 and 1.8 mm laser catheters at two centers in which 83% angiographic follow-up was available. Excimer laser-assisted balloon angioplasty was successful (less than 50% stenosis without major complications) in 85 (98.8%) pts with one (1.1%) semi-urgent CABG for balloon dissection and no Q-wave MI or death. In-hospital events included abrupt closure (<24 hr)in two (2.3%) pts treated with PTCA and early closure (72 hr) in two (2.3%) pts treated with elective CABG while 94.2% pts were discharged without major cardiac events. At ≥ 6 month follow-up, recurrence of symptoms and/or positive ETT occurred in 30/86 (35%) pts and angiographic restenosis (>50% stenosis) was observed in 30/74 (40.5%) pts. Using quantitative angiographic analysis, a post-laser stenosis prior to PTCA of < 30% was associated with a lower incidence of restenosis (25%) vs. (63%) for a post-laser stenosis ≥ 30% (p<0.05).
In conclusion, coronary excimer laser-assisted angioplasty is a safe procedure which may decrease acute complications by partially removing atheroma. Less residual stenosis after excimer laser angioplasty was associated with less restenosis. Improved catheters and techniques will be required to lower restenosis rates.